CLAIMS

1. A neutron measurement method for determining porosity of an earth formation surrounding a borehole comprising:

   - conveying a tool along said borehole, wherein said tool comprises a source of neutron radiation and at least one detector axially spaced from said source;

   - generating measured detector response for said at least one detector that is indicative of neutron radiation from said source interacting with said earth formations;

   - operating said measured detector response with a predetermined mathematical equation and thereby obtaining corrected detector response that is independent of the density of said earth formation; and

   - determining porosity of the earth formation surrounding the borehole from said corrected detector response.

2. The method according to claim 1, wherein said predetermined mathematical equation comprises multiplying the measured detector response by a correction factor that depends on the density of the formation.

3. The method of claim 2, wherein said measured and corrected near detector responses comprise a near detector count rate, said measured and corrected far detector responses comprise a far detector count rate.

4. The method according to claim 3, wherein said mathematical equation is of the form : $CR_{corr} = CR \times e^{\beta\rho}$,

   wherein CR_{corr} is the corrected detector count rate, CR is the measured detector count rate, β is the detector sensitivity to density and ρ is the formation density.

5. The method according to claim 4, wherein the detector sensitivity to density β can be adjusted in order to provide a corrected detector response that is independent of the borehole tool design.

6. The method of claim 1, wherein the source of neutron radiation is an isotopic source that emits fast neutrons.
7. The method of claim 1, wherein said near and far detectors are thermal neutron detectors.
8. The method of claim 1, wherein said near and far detectors are epithermal neutron detectors.
9. The method of claim 1, wherein said tool is conveyed by means of a drill string.
10. A neutron measurement method for determining porosity of an earth formation surrounding a borehole comprising:

 - conveying a tool along said borehole, wherein said tool comprises a source of neutron radiation and at least two detectors axially spaced from said source at different spacings;

 - generating measured detectors responses for each said at least two detectors that are indicative of neutron radiation from said source interacting with said earth formations;

 - selecting from said at least two detectors a pair of detectors comprising a near detector and a far detector, said near detector being placed closer to said neutron radiation source than said far detector;

 - operating in said pair of near and far detectors at least one of the measured detector response with a predetermined mathematical equation and thereby obtaining corrected detector response that is independent of the density of said earth formation;

 - forming a corrected ratio from said at least one corrected detector response and from said other detector response in said pair of near and far detectors; and

 - determining porosity of the earth formation surrounding the borehole from said corrected ratio.

11. The method according to claim 10, wherein said predetermined mathematical equation comprises multiplying the measured detector response by a correction factor that depends of the density of the formation.

12. The method of claim 11, wherein said measured and corrected near detector responses comprise a near detector count rate, said measured and corrected far detector responses comprise a far detector count rate.

13. The method according to claim 12, wherein said mathematical equation is of the form : $CR_{corr} = CR \times e^{\beta\rho}$,

wherein CR_{corr} is the corrected detector count rate, CR is the measured detector count rate, β is the detector sensitivity to density and ρ is the formation density.

14. The method according to claim 13, wherein the detector sensitivity to density β can be adjusted in order to provide a corrected detector response that is independent of the borehole tool design.

15. The method of claim 10, wherein both the measured near detector response and the measured far detector response are operated with the predetermined mathematical equation.

16. The method of claim 10, wherein the source of neutron radiation is an isotopic source that emits fast neutrons.

17. The method of claim 10, wherein said near and far detectors are thermal neutron detectors.

18. The method of claim 10, wherein said near and far detectors are epithermal neutron detectors.

19. The method of claim 10, wherein said tool is conveyed by means of a drill string.

20. A system for determining porosity of an earth formation surrounding a borehole comprising:

(a) a borehole tool comprising a source of neutron radiation and at least one detector; and

(b) a computer for computing measured response of said detector thereby obtaining a measure of the porosity of the earth formation surrounding the borehole, whereby:

- said measured response from said at least one detector is indicative of nuclear radiation from said source interacting with said earth formation;

- said measured response of said detector is operated with a predetermined mathematical equation using said computer to obtain corrected detector response that is independent of the density of the formation; said corrected detector response being indicative of the porosity of the earth formation surrounding the borehole.

21. A system according to claim 20, wherein said predetermined mathematical equation comprises multiplying the measured detector response by a correction factor that depends of the density of the formation.

22. A system according to claim 21, wherein said measured and corrected near detector responses comprise a near detector count rate, said measured and corrected far detector responses comprise a far detector count rate.

23. A system according to claim 22, wherein said mathematical equation is of the form: $CR_{corr} = CR \times e^{\beta\rho}$,

wherein CR_{corr} is the corrected detector count rate, CR is the measured detector count rate, β is the detector sensitivity to density and ρ is the formation density.

24. A system according to claim 23, wherein the detector sensitivity to density β can be adjusted in order to provide a corrected detector response that is independent of the borehole tool design.

25. A system according to claim 20, wherein the source of neutron radiation is an isotopic source that emits fast neutrons.

26. A system according to claim 20, wherein said near and far detectors are thermal neutron detectors.

27. A system according to claim 20, wherein said near and far detectors are epithermal neutron detectors.

28. A system according to claim 20, wherein said tool is conveyed by means of a drill string.

29. A system for determining porosity of an earth formation surrounding a borehole comprising:

(a) a borehole tool comprising a source of neutron radiation and at least two detectors axially spaced from said source at different spacings, said detectors comprising a near detector and a far detector, said near detector being placed closer to said neutron radiation source than said far detector; and

(b) a computer for combining measured responses of said at least two detectors thereby obtaining a measure of the porosity of the earth formation surrounding the borehole, whereby:

- said measured responses from said at least two detectors are indicative of nuclear radiation from said source interacting with said earth formation;

- at least one of said measured responses of said detectors is operated with a predetermined mathematical equation using said computer to obtain corrected detector response that is independent of the density of the formation;

- said corrected detector response and other detector response in said pair of near and far detectors are combined using said computer to form a corrected ratio; and

- said corrected ratio is indicative of the porosity of the earth formation surrounding the borehole.

30. A system according to 29, wherein said measured and corrected near detector responses comprise a near detector count rate, said measured and corrected far detector responses comprise a far detector count rate.

31. A system according to claim 30, wherein said mathematical equation is of the form : $CR_{corr} = CR \times e^{\beta\rho}$,

wherein CR_{corr} is the corrected detector count rate, CR is the measured detector count rate, β is the detector sensitivity to density and ρ is the formation density

32. A system according to claim 29, wherein both the measured near detector response and the measured far detector response are operated with the predetermined mathematical equation.

33. A system according to claim 29, wherein the source of neutron radiation is an isotopic source that emits fast neutrons.

34. A system according to claim 29, wherein said near and far detectors are epithermal neutron detectors.

35. A system according to claim 29, wherein said near and far detectors are thermal neutron detectors.

36. A system according to 29, wherein said tool is conveyed by means of a drill string.